

# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT



(PCT Article 36 and Rule 70)

REC'D 14 JAN 2005

by IPO PCT

Applicant's or agent's file reference 3.76322001	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/EP 03/09803	International filing date (day/month/year) 04.09.2003	Priority date (day/month/year) 05.09.2002
International Patent Classification (IPC) or both national classification and IPC C07F17/00		
Applicant BOREALLS TECHNOLOGY OY et al.		

1.	This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2.	This REPORT consists of a total of 4 sheets, including this cover sheet.  <input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  These annexes consist of a total of 3 sheets.
3.	This report contains indications relating to the following items:  I <input checked="" type="checkbox"/> Basis of the opinion II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application

Date of submission of the demand  02.04.2004	Date of completion of this report  13.01.2005
Name and mailing address of the International preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  Balmer, J-P  Telephone No. +49 89 2399-8520  

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/EP 03/09803

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-11 as originally filed

**Claims, Numbers**

1-14 filed with telefax on 08.12.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).  
☐ the language of publication of the international application (under Rule 48.3(b)).  
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority in written form.  
☐ furnished subsequently to this Authority in computer readable form.  
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.  
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

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International application No. **PCT/EP 03/09803**

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**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes: Claims	1-14
	No: Claims	
Inventive step (IS)	Yes: Claims	1-14
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-14
	No: Claims	

**2. Citations and explanations**

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP 03/09803

Ad section V

1. Reference is made to the following documents:

- D1: EP-A-0 360 492 (MITSUI PETROCHEMICAL IND) 28 March 1990 (1990-03-28)  
D2: EP-A-0 638 595 (MITSUI PETROCHEMICAL IND) 15 February 1995 (1995-02-15)  
D3: EP-A-0 685 494 (DANUBIA PETROCHEM POLYMERE) 6 December 1995 (1995-12-06)  
D7: US-A-5 908 903 (ROESCH JOACHIM) 1 June 1999 (1999-06-01)  
D8: BELELLI, PATRICIA GABRIELA ET AL: "Addition of lewis bases and acids. Effect on.alpha.-olefins polymerization with soluble metallocenes, 1 ethylene" MACROMOLECULAR CHEMISTRY AND PHYSICS (2000), 201(13), 1458-1465, XP002264928  
D10: FISCHER D ET AL: "DONOR-AND ACCEPTOR-MODIFIED METALLOCENE-BASED HOMOGENEOUS ZIEGLER-NATTACATALYSTS" MAKROMOLEKULARE CHEMIE, MACROMOLECULAR SYMPOSIA, HUTHIG UND WEPF VERLAG. BASEL, CH, vol. 66, 1 February 1993 (1993-02-01), pages 191-202, XP000360502  
D11: FERREIRA, M. L. ET AL: "Effect of Co- and non-copolymerizable Lewis bases in propylene polymerization with EtInd<sub>2</sub>ZrCl<sub>2</sub>/MAO" MACROMOLECULAR CHEMISTRY AND PHYSICS (2001), 202(6), 830-839, XP002265698

2. None of the cited documents from the prior art mentions the preparation of an unsupported metallocene catalyst as presently claimed.  
Accordingly the present invention is novel with regard to Article 33(2) PCT.
3. None of the cited prior art documents taken alone or in combination leads to the preparation of an unsupported metallocene catalyst as presently disclosed in order to polymerize olefins with a reduced fouling and without the use of a support.  
Accordingly the present invention involves an inventive step with regard to Article 33(3) PCT
4. Industrial applicability is acknowledged (Article 33(4) PCT).

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## Claims

1. A process for the preparation of an olefin polymerisation catalyst comprising:
  - 5 a) reacting an aluminoxane and a Lewis base in an optionally halogenated hydrocarbon solvent to form a particulate suspension;
  - b) reacting said suspension with a metallocene complex in an optionally halogenated hydrocarbon  
10 solvent; and optionally
  - c) isolating the olefin polymerisation catalyst.
2. A process as claimed in claim 1 wherein said aluminoxane is MAO.  
15
3. A process as claimed in any one of claims 1 or 2 wherein the optionally halogenated hydrocarbon solvent used during step a) is an optionally halogenated C<sub>4-12</sub> alkane or C<sub>6-12</sub> arylene.  
20
4. A process as claimed in claim 3 wherein said hydrocarbon solvent is toluene or xylene.
5. A process as claimed in any one of claims 1 to 4  
25 wherein the solvent employed in step b) is the same as that employed in step a).
6. A process as claimed in any one of claims 1 to 5 wherein said Lewis base is an aliphatic or aromatic  
30 amine, alcohol, thiol, aldehyde, ketone, carboxylic acid or ether or mixture thereof.
7. A process as claimed in claim 6 wherein said Lewis base is phenol, benzyl alcohol, aniline or benzylamine  
35 or mixture thereof.
8. A process as claimed in claim 6 wherein said Lewis

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ART 34 APART

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base is an aliphatic or aromatic diamine, diol, triol, hydroxy ether or mixture thereof.

9. A process as claimed in claim 8 wherein said Lewis  
5 base is ethylene glycol, glycerol, bisphenol, triethanolamine, butanediol, 4,4'-isopropylidenediphenol, 3-hydroxypropylene oxide or 1,4-butanediol diglycidyl ether.
10. A process as claimed in any one of claims 1 to 9  
10 wherein the ratio of aluminium in the aluminoxane to Lewis base is 5 to 40 mol/mol.
11. A process as claimed in any one of claims 1 to 10  
15 wherein the metallocene complex is bis(n-Bu-cyclopentadienyl) zirconium dichloride.
12. A process as claimed in any one of claims 1 to 11  
20 wherein the molar ratio between aluminium in the aluminoxane and the transition metal in metallocene is in the range 20:1 to 1000:1.
13. A catalyst obtainable a process as claimed in any  
25 one of claims 1 to 12.
14. The use of a catalyst as claimed in claim 13 in  
olefin polymerisation.
15. Use of the reaction product of an aluminoxane and a  
30 Lewis base to form a catalyst carrying suspension in an optionally halogenated hydrocarbon solvent.
16. A process for the preparation of polyolefins  
comprising polymerising at least one olefin in the  
35 presence of an olefin polymerisation catalyst as claimed in claim 13.

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ART 34 AMDT

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17. A process for the preparation of a prepolymerised olefin polymerisation catalyst comprising:

- 5       a) reacting an aluminoxane and a Lewis base in an optionally substituted hydrocarbon solvent to form a particulate suspension;
- b) reacting said suspension with a metallocene complex in an optionally substituted hydrocarbon solvent to form a catalyst;
- 10       c) prepolymerising said catalyst in the presence of an olefin; and optionally
- d) isolating the prepolymerised catalyst.

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ART 34 AMDT